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Non-Markovian effects in liquid dielectrics

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Abstract

The set of kinetic equation for the time correlation function of polarization in the correlation approximation of the second order has been obtained with the help of the Zwanzig-Mori projection operators method. In the range of the orientational polarization this approximation appears as a result of using the Bogolubov's time scale hierarchy and neglecting the inertia effects in the molecule dynamics. The non-Markovity parameter of the orientational polarization process was introduced. The obtained dielectric spectra are the non-Debye's one and depend on the polarizational process non-Markovity parameter. The narrowing of the dielectric losses line $\varepsilon''(\omega)$ in the polar liquids in the Poley's absorption range is explained by the non-Markovian nature of the angle velocity time correlation of the molecule. The Debye's type of polarization in the formulae obtained is a particular limit case. The microscopic expressions for the orientational relaxation time and the non-Markovity parameter were obtained.